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81F. The Role of E-collaboration Technologies in the Design of Virtual Organizations: Brazilian Cases

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Abstract

The Internet and other integration tools, such as software for supply chain management (SCM), as well as electronic interactions between business players in the product's value chain, have transformed the economy. This transformation has been described by a variety of names, including innovation economy, knowledge economy, network economy, informational economy. The convergence and interaction between a new technological paradigm and a new organizational logic constitute the historic basis of informational economy. Thus, the present research aims to analyze the role of E-collaboration technologies in the design of virtual organizations. The methodology adopted for this research was case study, performed in two organizations from the manufacturing sector. The study investigated the main variables involved in the company's process of organizing itself virtually, with direct reflections on its organizational design.

Keywords

Virtual Organization, Organizational Design, Information Technology.

1. Introduction

To collaborate means “working together to produce something with benefits for both”. Therefore, in the current competitive context, collaboration can be a way to create value and innovate. Organizations share resources, share and exchange information and can overcome some of their weak points. Bittici et al (2005) mention that the collaborative organization refers not only to the supply chain, but also to networks and clusters, including collaboration in product development (chain design) and product support (support chain). The collaborative organization extends the concept of chains and strategic alliances, as each organization tries to maximize its performance. According to the author, the collaborative enterprise aims to optimize the whole system and the gains are divided among the partner companies. Bittici et al (2005) add that the collaborative enterprise is a knowledge-based organization that uses the capacities, competences and intellectual strengths of its partners to gain competitive advantage to maximize the performance of the global enterprise.

In this context, information technology plays an important role, enabling organizations to establish relationships in order to foster, together, good results and productivity. According to Tapscott & Ticoll (2005), the most sophisticated tools for collaboration and management

will be available and it will be possible to conduct more complex projects, like, for example, the co-creation of products.

Thus, the present research aims to analyze the role of E-collaboration technologies and their impact on the design of virtual organizations. The adopted methodology was case study, conducted in two Brazilian organizations of the manufacturing sector. The research investigated the technologies that were adopted aiming at collaboration and the consequent impact on the design of the organizational structure, using the possibilities that virtuality can bring.

2. Theoretical reference

According to Tapscott & Williams (2007), the rhythm of change and the evolution of customers' demands are so quick that companies can no longer depend only on their internal capacities to meet external needs. Nor can they rely on relationships that were strongly established with some partners to accompany the customers' desire for speed, innovation and control. Companies must interact in a dynamic way and create in a joint effort with partners, competitors, government and, above all, with the customers.

It is important to emphasize that Collaboration is seen as the crucial competence to integrate the individuals' capacity and distant organizations into the creation of wealth in the economy (Tapscott & Williams, 2007).

2.1 e-Collaboration

Related e-collaboration can be observed many theories have been used to understand e-communication and e-collaboration behavior (Kock, 2004).

According to Kock & Nosek (2005), e-collaboration has been defined in many ways, and this situation has been intensified by the emergence of an e-collaboration tools industry. The definition of the e-collaboration is "collaboration among individuals engaged in a common task using electronic technologies". Based on the definition can be understood that, contrary to popular perceptions, e-collaboration is not limited to computer mediated communication (CMC).

Cassivi (2006) stated that different roles may be attributed to collaboration tools, such as facilitating access to information, which affects knowledge creation capabilities, and assisting in the design of flexible supply chains.

Hagel et al. (2002) mentioned information technology as an enabler in accelerating the development of the networks process and increasing the economic value than can be generated from them.

2.2 Organizational Design

According to Vreed & Dickson (2000) there are Information Technology (IT) tools have emerged offering new ways of coordinating and of collaboration business process, as example, EDI (Electronic Data Interchange), e-mail, Intranets, others. These tools of IT represent an enabler to redesign the organization. Malone & Rockart (1991) observed that IT

tools are shifting from supporting activities towards supporting coordination activities as well.

Virtualization is a condition that transcends the organization's physical aspect. The transparency provided by IT allows companies to reposition themselves in the chain and collaborate dynamically with other companies with the purpose of optimizing their position in the business.

As discussed by Venkatraman & Henderson (1998), the central question in the choice of one form of organizing a company virtually is to know how to explore core competences of the organization. Subsequently, the organization will have to choose the concrete design of the structure, using the virtual possibilities. This leads to the possibility of a "mosaic" of organizational forms, that is, of different degrees of utilization of the virtual hypotheses according to three fundamental dimensions that were investigated by the authors mentioned above: assets configuration, customer interaction and knowledge leverage. To organize virtually is an option of organizational design that is carried out in accordance with and to support the execution of the defined strategy.

Venkatraman & Henderson (1998) consider that virtuality is a characteristic that can be applied to any organization. However, this emerging architecture of virtual organizations is not possible or cannot be constituted without the significant power of IT. Considering that virtuality can be applied to any organization, these authors developed a model in which virtuality is defined as a strategy that reflects three distinct but interdependent vectors:

- .Customer interaction vector;
- .Asset configuration vector;
- .Knowledge leverage vector.

Each vector has three distinct stages, as shown in Figure 1:

Stage one focuses on task units (such as customer service, new product development, purchasing).

Stage two focuses on the organizational level, that is, how to coordinate activities to create economic value.

Stage three focuses on the inter-organizational network, aiming to obtain innovation and growth.

These three vectors have traditionally worked independently, focusing on the tasks separately; however, considering the context of the virtual organizations, these vectors have started to act in an integrated way, and this integration is sustained by IT. The IT platform sustains and designs the new business model.

The first vector, organizational virtuality, represents interaction with the customer (virtual encounter). This vector deals with challenges and opportunities for the interaction between companies and customers. IT enables customers to try products and services remotely, to participate actively in the dynamic customization process and to create communities of customers.

In the first stage of this vector, customers may be anywhere in the world, having a remote experience with products and services through the intensive use of IT.

Organizational virtualization allows customers to indicate the parameters for the dynamic customization of products and services. Companies that use Internet as a means of interaction with customers have benefited from dynamic customization, since consumers, for example,

can configure the computer they wish to acquire step by step, establish its price and order its manufacture and delivery to any city (Venkatraman & Henderson, 1998).

Venkatraman & Henderson (1998) believe that companies need to change their way of seeing the marketing processes, ceasing to have the inside-outside perspective. In the authors' view, concentrating on an outside-inside approach increases the companies' efficiency in their organization and they are able to change – and to adapt to new scenarios more quickly.

The second vector proposed by Venkatraman & Henderson (1998) refers to asset configuration. This vector is a movement that is contrary to vertical integration, as it depends on components obtained externally, from commercial partners. The authors believe that a virtual company becomes successful when it has a close relationship with its suppliers, creating a shared destiny. In an extreme situation, the borders between companies and their business partners become not focused and obscure.

This vector aims to explain the movement of many companies, even the “less virtualized” ones, in the direction of finding reliable partners to take on activities in which the company does not consider itself capable of adding so much value to the customer, compared to the value that may be added by these partners. Concerning this aspect, Hammel & Prahalad (1995) suggested that companies must concentrate on their central competences, looking in the market (or developing) for specialized suppliers for the parts of the products or services offered by them, provided that they do not consider them strategic or liable to be developed with greater competence by another link of their value chain. IT is impelling this trend because it facilitates the coordination of the companies' activities with their partners, transforming the structure of a competent value chain into a great source of competitive advantage.

The third and last vector proposed by Venkatraman & Henderson (1998) is the influence of knowledge, that is, the mechanisms and possibilities to potentialize knowledge in many levels. This architecture represents, in Venkatraman & Henderson's (1998) opinion, the structure to conduct the business, the guide that provides a context for the organization.

Vectors	Stage 1	Stage 2	Stage 3
Customer Interaction	Remote experience with products and services	Dynamic Customization	Communities of Customers
Asset Configuration	Modules	Interdependent Process	Coalition of Resources
Knowledge Leverage	Work unit	Corporate Asset	Professional Community
Characteristics	Stage 1	Stage 2	Stage 3
Focus	Tasks	Organization	Inter-Organization
Performance Objective	Efficiency (ROI)	To Add Economic Value (EVA)	Innovation and Sustainable Development (MVA)

Figure 1- Virtual Organization: Three Vectors and Three stages (adapted from Venkatraman & Henderson,1998)

Some authors have considered the virtual organization as the architecture of the business model of the 21st century.

3. Case and Results

The chosen method for the development of this research was the Case Study. According to Yin (1994), the Case Study, or the central tendency of all types of Case Studies, is that they aim to clarify “one decision or a set of decisions: why have they been made? How have they been implemented? What results have been achieved?” The present study was carried out through semi-structured interviews with three professionals from the company (logistics manager, IT professional and the production director) and through secondary data obtained from the organization. The main questions related to the study are below:

- Why is company deploying virtualization?
- What types of IT systems have you deployed virtualization technology?
- Describe the virtualization process for the company.
- What the steps for virtualization process? What about the use e-collaboration technologies?
- What the role of the e-collaboration tool in the design virtual organizations?

3.1 Case Description – Company A

The studied company occupies a leading position in the sector of technology and engines manufacturing. The start-up of its operations in Brazil was in 1960. In 1995 it started its internationalization process with the opening of a plant outside the country. Later on, the company did a joint venture and in 2001 the control was handed to an international group. Nowadays, the company has three industrial units in Latin America and two in the USA.

Supply and distribution flow

Figure 2 shows the supply and distribution flow of the products of the analyzed company. It is possible to observe that the plants are installed in Latin America and in the USA, and besides the customers in Brazil, it has customers in the USA, England, Germany, France, Spain, and Italy. Managed by the EDI process (*Electronic Data Interchange*), the logistics guarantees just-in-time deliveries of the engines, that is, in the configurations and sequence programmed by the plant to decrease costs and inventories.

The studied company synthesized the elements into an integrated manufacturing system through the use of the web platform. A portal was developed, aiming to support the processes of supply chain planning and control.



Figure 2-Configuration of the Company's Chain

Chain Management WEB Platform

150 thousand dollars were invested in the platform for managing the operations along the production chain. The implementation of the project lasted 2 years. The main reasons for the development of the web platform for managing the production chain were: extremely fragile execution control process (large influence of the human factor), need of more reliability and lower time of response, need of collaboration in the planning process, and demand volatility (volume and mix).

The functionalities of the portal are:

Portal's Functionalities	Description
Schedule of supplier's deliveries	<ul style="list-style-type: none"> - On-screen visualization, Print of schedule; - Download of files in Acrobat Reader format; - EDI in standard Anfavea format, automatic notices by e-mail at each new schedule;
Collaborative Planning: Schedule Acceptance (Aceite)	<ul style="list-style-type: none"> - Updates Purchase Orders according to the received acceptance, reduces negotiation time;
Advance Shipment Notice (ASN)	Supplier informs shipment via: <ul style="list-style-type: none"> - Record on a WEB screen - Upload of RND – (Text file in standard Anfavea format);
Payments to Suppliers	Control via web of payments to suppliers

Table 1– Portal's Functionalities for the Chain Management

Other Functionalities – Distributors

The company developed a portal for the distributors. Its main functions are: flow, monitoring and cancellation of orders to the manufacturer, as well as detailed consultations about the

status of the orders. Half of the distributors network is connected. This will reduce the amount of calls the customers have to make to know the status of their orders.

3.2 Case Description – Company B

The selected company (Company B) is a subsidiary of the largest home appliances manufacturer and has leading brands in Brazil. It is the largest company of the white line sector in Latin America. The company launched more than 400 products and sold approximately 44 million home appliances in Brazil and abroad.

Interviews were carried out with at least three professionals from the company (CIO, project managers and executives from the business area), based on the established script. However, during the interviews, there were attempts to obtain, through the conversation, more subsidies for the qualitative analysis of the case.

Company B first concentrated on implementing the Internet Sales application and that IT application module covers all the processes for selling goods over the Internet - from an online product catalog, through order entry and electronic monitoring of order processing, to payment procedures. The project was started in September 2001 - and completed after only three months in December of the same year.

The processes in this key area were realized using a business-to-business scenario. Company B customers dial in to their specific part of the Company B portal using a login ID and password. There they can access the online catalog, which includes a photo gallery and technical product specifications.

Almost all Company B products are presented in the catalog in real-time, each with its specific price conditions. Special "shopping carts" are available to facilitate the buying process. There are pre-filled order forms designed to speed up the processing of frequently repeated standard orders. Customers can also get up-to-date information on the status of their orders at the click of a mouse, and just as easily view their account to see whether they still have any outstanding items to pay for - 24 hours a day, seven days a week.

During the first phase of the project, Company B only allowed a select handful of customers to access its CRM portal. "It was still very early days, so we wanted to begin by finding out exactly how we could best use the solution and what other requirements people were likely to have," says company's CIO, explaining this approach.

However, preparations for rolling the application out to additional customers are now in full swing, with the second wave due to start next Fall. The aim is to involve more partners and to increase the number of regular users of the new channel. Once the solution has been established, Company B will consider adding new features and will gradually implement more components of IT tools.

The Internet investments started in 2001, with the initial aim of offering a transactional channel to the customers, where they would be able to consult the on-line catalogs, place orders, and check the order status. Subsequently, the company advanced in its use of the

Internet, aiming to intensify the interaction with customers, offering a dynamic customization of one of its products (refrigerators), as described below.

Company B's technicians and designers take 12 to 15 months to create a new model of refrigerator. Thus, after the launch, in four or five months the competitors provide the stores with a similar product, taking the advantage of innovation from Company B. A position is never guaranteed in relation to the competitors. Since the end of last year, however, the analyzed company has been trying to differentiate itself from the competitors, with the launch of a personalized product. The consumer can assemble his own product, choosing colors, shelves, accessories and compartments according to his need and desire. A total of 19 thousand combinations is possible, including bicolor versions. This refrigerator is a niche product, made on request and available in the size of 480 liters. Its share in the company's total sales will never exceed one digit, according to the company's product manager. Even so, before launching the concept in the market, Company B promoted a revolution in the whole process of sale, production and delivery. The purchase can only be carried out in the company's site. There, the consumer chooses each item and adds it to the product and the final price is approximately 10% to 15% higher than the normal price. It is not necessary to conclude the purchase all at once. The consumer can store his creation and go back to it to make alterations. In case of doubts regarding the color (on the computer screen, the shades may be a little different), Company B sends to customer home small painted steel plates.

Nevertheless, the most complex equation was outside the factory. Company B offers 570 models of standardized refrigerators. Each one of them is linked to a code in the production system. It was impossible to add 19 thousand new codes to the program, according to the company's e-business manager. The system would not support it. Thus, just four new codes were created: two for voltage (127 or 220 volts) and two for having the water filter on the door or not. The other items are chosen in a separate file, attached to the order.

The next difficulty showed up in the product's manufacturing. In an automated mass production assembly line, with a productive capacity of 20 thousand units a day, how could a specific refrigerator be manufactured without interrupting the production flow? Then, the role of the specialized operator emerged; therefore and this place was designated to the quality auditor. The refrigerator gets in and out of the line according to this auditor's orders. At each point, he indicates to the assembler the items ordered by the customer and this goes on up to the final point, in a kind of "parallel crafted line". The customized refrigerator is identified by a name, chosen by the customer himself at the moment of purchase.

Another functionality that has been implemented is the portal of integration with suppliers, Integrated Supplier Management, through which the company supervises the demand, collaborates with its partners, elaborates quality reports and accounts receivable.

Another Internet resource that has been tested by the company for the purchase of non-productive materials are the purchase auctions, which are the opposite of the products sale auctions; that is why they are also called reverse auctions. Through the purchase auctions, potential suppliers compete against one another to see who is able to provide the best offer for the company. The purchasers inform the maximum price they are willing to pay and the

potential suppliers submit their proposals, in the format of successive and decreasing bids issued in a short period of time, until a supplier proposes a price that is not beaten by the competitors.

Through the web channel the company also offers a catalog of parts, manuals and bulletins available by means of a password to 100% of the authorized technical assistance network spread all over the country. Before this, the technical assistance network could only consult the catalog. This already was a significant advantage, considering that the studied company is the only manufacturer of all the white line products: refrigerators, freezers, stoves, microwave ovens, dishwashers, washing machines and tumble-driers, air conditioners, air purifiers and others. Then, the company implemented the on-line purchase.

The company now has its training program for the technical assistances via the Internet, aiming to expand its e-learning system. The use of the Corporate Portal has been increasing day by day in the organization. Nowadays, it represents the main means of access to the corporate systems.

“All the complexity of our information systems, which include mainframes and multiple databases, appears in a single screen to the user”. The CIO says:

“The company gains simplicity and speed. In other words, productivity”.

Analyzing the results according to the theoretical framework, it is possible to observe that the studied company adopted virtualization using the Internet as the main tool. The organization started its virtualization process with the implementation of the sales portal, offering the following on-line services: products catalog, order placement, electronic monitoring of the order status, and payment procedure.

The process begins in 2001 and analyzing the case in light of the Model proposed by Venkatraman & Henderson (1998), it was observed that the company initially searched for interaction with the customer, offering a remote experience of the product. Subsequently, the company advanced in its use of the Internet offering a dynamic customization of the product (refrigerator). In that case can be observed that the organizational virtualization allows consumers to indicate the parameters for the dynamic customization of products and services. Consumers can, for example, configure the refrigerator they wish to acquire step by step, establishing its price. This aspect of interactivity provides a better relationship with the customer and creates new paradigms for product and service design. Thus, based on the Model proposed by Venkatraman & Henderson (1998), it was verified that the company is in the second stage for the customer interaction vector. Regarding the asset configuration vector, the company is in stage 1, aiming at an integration with suppliers through the portal Integrated Supplier Management.

According to information received from the interviews the company became a true believer in the value of collaborating with suppliers based on some hard-won lessons learned from its experience supplying major retailers. These lessons on the “outbound” side, notes responsible for Supply Chain management, ultimately proved a catalyst to the company efforts to improve the effectiveness of its own “in-bound” supply chain.

These lessons are embodied in a philosophy of the company calls “demand flow,” which holds simply that if information can be deployed accurately and quickly across the value chain—all the way from company’s customers back to its suppliers and to its suppliers’ suppliers—then the whole “demand flow chain” will function better and at lower cost.

The third and last vector proposed by Venkatraman & Henderson (1998) refers to mechanisms and possibilities to enhance the potential of knowledge in several levels. Concerning this vector, it was observed through the case study that the company implemented the training program for technical assistances via the Internet, aiming to expand its e-learning system, according to stage of the Model the company is in stage 1.

3.3 Analysis of the Results

Analyzing the results according to the theoretical framework, it was observed those studied companies A and B adopted as the main e-collaboration tools the Internet. The organization A started its virtualization process with the implementation of the chain management portal, offering the following on-line processes: Collaborative Planning, Payment to Suppliers, Monitoring of Shipments and Schedule of Supplier’s Deliveries. In this context, the study indicates that the WEB platform represented a means of integrating the elements of the manufacturing system. Each movement of origin and destination is electronically monitored by EDI, providing the customers and the involved operators with a complete view of the operation. In this context, Information became the main conductor, allowing a virtual integration of the members, independently of their location.

The Portal enabled the communication, collaboration and trade between many users and geographical regions. And, more importantly, it joins suppliers and global partners using a single, standardized, flexible and open architecture, allowing improvements in productivity, vision and dialog, with a lower number of connections to be maintained.

The transparency allowed by IT provides insights for repositioning in the chain and means for collaboration between companies, with the purpose of optimizing their position in the business.

Organization B the process begins in 2001 and analyzing the case in light of the Model proposed by Venkatraman & Henderson (1998), it was observed that the company initially searched for interaction with the customer, offering a remote experience of the product. Subsequently, the company advanced in its use of the Internet offering a dynamic customization of the product (refrigerator). It was observed that the organizational virtualization allows consumers to indicate the parameters for the dynamic customization of products and services. Consumers can, for example, configure the refrigerator they wish to acquire step by step, and finally obtaining its price. This aspect of interactivity provides a better relationship with the customer and creates new paradigms for product and service design. Thus, based on the Model proposed by Venkatraman & Henderson (1998), it was verified that the company is in the second stage for the customer interaction vector. Regarding the asset configuration vector, the company is in stage 1, aiming at an integration with suppliers through the portal Integrated Supplier Management.

Summary - Cases

Description	Case Analysis – Company A	Case Analysis – Company B
Collaboration tool	WEB Portal ; EDI in standard Anfavea format, automatic notices by e-mail at each new schedule	WEB Portal offering a dynamic customization of the product (refrigerator) and integration with suppliers through the portal Integrated Supplier Management.
Design Virtual Organization	Started virtualization with the implementation of the chain management portal, offering the following on-line processes: Collaborative Planning, Payment to Suppliers, Monitoring of Shipments and Schedule of Supplier's Deliveries	In the analyzed case, the company is allowing consumers to indicate parameters for the dynamic customization of products and services, configuring, step by step, the refrigerator that they want to acquire, establishing its price, ; another point refers about e-learning that is allowing the training program for technical assistances via the Internet;

Table 2– Summary Cases

4. Conclusion and results

These studied cases indicated that the electronic tools have significantly impelled the changes in the organizational structures. The virtualization of the supply chain of company A produced a new configuration that focuses on the electronic relationship, aiming at greater flexibility and adaptation. Along the same line, company B also indicated that its processes were redesigned, showing that e-collaboration is more than a technological advance. It is important to mention that structuring the activities to support the electronic communication is a critical factor for success. In the case of company B, the functionality that was implemented in its portal, allowing customers to customize the products, required changes in the production process and, consequently, a new design of the organizational processes.

Virtual possibilities like e-collaboration leads to the possibility of creating a mosaic of organizational forms, as mentioned by Venkatraman & Henderson (1998), due to three fundamental dimensions: assets configuration, customer interaction and knowledge leverage. The degree of virtualization of the companies has been increasing, but it is still limited to some companies and in initial stages, as discussed in the presented cases. It was observed that, to company A, collaboration refers only to the supply chain and in company B, besides the supply chain, the theme collaboration is beginning to be introduced in customer interaction.

Collaboration is changing the way companies use knowledge and the capacity to innovate in order to create value. This affects management aspects and, consequently, their business processes.

The theme e-collaboration opens several research paths, involving both theoretical and empirical aspects. If the collaboration tools are elements that foster organizational design, as this work sustained, investigations in other sectors should be conducted in order to elaborate

a panorama that can show the innovation possibilities in their business processes and the way to interact with customers, partners, competitors and the government.

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